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TOWARD A CANADIAN ANTARCTIC RESEARCH PROGRAM

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Canadian Polar Commission
April 1996

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Prepared for the Canadian Polar Commission by

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PREFACE

This report, *Toward A Canadian Antarctic Research Program*, has been accepted by the Board of Directors of the Canadian Polar Commission. It will form the basis and direction of the Commission's work with those Canadians dedicated to the development of an overall Canadian Antarctic Research Program.

It has long ben recognized that while Canadians are at the forefront in a wide variety of Antarctic research initiatives—both in field work and in the support of science—our country does not have a national Antarctic research program. The Canadian Polar Commission believes that such a program must be developed, given the importance of this region of the world and the ever-increasing relationship between the Arctic and Antarctic.

The Commission, along with members of CARP, have set out a series of initiatives, including bipolar exchanges between Antarctic and Arctic scientists, that we believe will lead to the creation of a national Antarctic program. There are many research agencies and departments, both governmental and non-governmental, that we must involve in the process.

On behalf of Canada, the Canadian Polar Commission has applied for and been granted associate membership in SCAR, the Scientific Committee on Antarctic Research. We are confident that this report and the actions taken to date have us well-placed to meet our objective of a Canadian Antarctic research program and full membership in the Antarctic research community.

Whit Fraser
Chairman

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TOWARD A CANADIAN ANTARCTIC RESEARCH PROGRAM

1. INTRODUCTION

In November 1995, the Canadian Polar Commission (CPC) arranged a small meeting to discuss steps to develop a Canadian Antarctic Research Program (CARP). An earlier version of this report, under the title, *Draft Business Plan for the Canadian Antarctic Research Program Committee*, was prepared as a background document for those discussions. This revised version incorporates the results of those discussions and acknowledges the contributions of the participants (Annex 1).

The impetus for the meeting and the preparation of the report stems from the mandate of the CPC which, according to the Canadian Polar Commission Act, is "...to promote the development and dissemination of knowledge of the polar regions...", including the Antarctic. The report seeks to link this legislative mandate to specific objectives, and to a set of tasks aimed at fulfilling that mandate with respect to Antarctica. The report also discusses the allocation of resources, organization, and accountability. It builds on past accomplishments, but the focus is on **planning for the future.**

Is it possible to establish a new research program in a period of severe financial constraint? The answer is Yes, as such periods also afford an opportunity for reflection and consideration of new approaches. Canada's science effort in Antarctica ought to be reassessed in view of the requirements of the Protocol on Environmental Protection to the Antarctic Treaty[1] which Canada has signed. The current science effort is likely to be found wanting. Additional funding will be required to change this, and new and innovative ways of finding resources will be required. However, compared with the federal S&T expenditures of some $ 6 billion per year, the amounts involved are not large. The required change in attitude—the way we look at Canada's role in the Antarctic—may pose a greater challenge.

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[1] Also known as the *Madrid Protocol*.

The following section briefly outlines recent Canadian developments with regard to Antarctica and reviews the Canadian Polar Commission's activities with respect to Antarctic issues. Factors pertinent to Canada's interests in Antarctic science are then reviewed, and a set of revised objectives for the Executive Committee of the Canadian Antarctic Research Program (CARPEX) are suggested. This is followed by a proposed work program designed to achieve these objectives and a discussion of the human and financial resources required. The next section deals with financial and other support for the research activities themselves; a separate section deals with some policy issues relevant to the establishment of the CARP. The final section is "Summary and Recommendations".

2. BACKGROUND

The International Geophysical Year (1957–59) was a milestone in the recent development of Antarctica (Fig. 1). It led to the formation of the non-governmental Scientific Committee on Antarctic Research (SCAR)[2] in 1958 and, in 1959, to the signing of the intergovernmental Antarctic Treaty (AT) which entered into force in 1961. Twelve countries were involved in developing both these initiatives, but other nations have joined since; by 1995, 42 countries had ratified the Antarctic Treaty and 32 were members of SCAR.

Canada was rather late in joining the Antarctic groups and did not accede to the Antarctic Treaty until May 1988 when it became the 38th country to ratify the Treaty. Canada is a non-Consultative Party to the Antarctic Treaty, which means it does not have the right to vote on important decisions.[3] Since then, however, the federal government has taken a number of steps toward closer links with Antarctica (e.g., ratified two conventions under the Treaty; signed the Protocol on Environmental Protection to the Antarctic Treaty; established the Canadian Polar Commission; and appointed an Ambassador for Circumpolar Affairs.) (See Table II.) The mandates of both the CPC and the Ambassador for Circumpolar Affairs make specific reference to Antarctica. Although the pace of development over the six years between 1988 and 1994 has been relatively rapid, limited resources still restrict Canada from playing a major role in Antarctica.

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[2] Originally called the Special Committee on Antarctic Research.
[3] There are presently 26 Consultative and 16 non-Consultative Parties.

In addition to federal initiatives, Canada joined the non-governmental SCAR as an Associate Member in September 1994. In the private sector, Canadian companies continue to supply goods and services to the Antarctic operations of several countries. A more recent development is the emergence of Toronto-based Marine Expeditions Inc., which now transports about one-quarter of the estimated 8,000 tourists visiting the continent each year.

The CPC 's first major initiative on Antarctic issues was the *Antarctic Science Workshop* held at the University of Ottawa in February 1993.[4,5] The workshop led to the formation of the Executive Committee for the Canadian Antarctic Research Program (CARP) which consisted almost exclusively of members with Antarctic field experience. The committee provides valuable advice on Antarctic issues to government agencies, private-sector groups and to the public at large. Since its formation, the CARP Executive Committee has pursued several initiatives (e.g., publication of a newsletter; creation of a database of Canadians interested in Antarctic issues[6]; and establishment of links with Antarctic programs in other countries, notably Argentina, Germany, New Zealand, the U.K., and the U.S.A.). This work has been accomplished on a shoe-string budget from the CPC; thus, the November 1995 meeting in Ottawa was called, in part, to discuss how additional resources might be obtained.

A recommendation from the 1993 workshop led to Canada becoming a member of SCAR at the Committee's meeting in Rome in September 1994. SCAR, as a non-governmental international body, consists of representatives of the scientific communities in member countries; the CPC is the adhering body in Canada. Joining SCAR was an essential step for the CPC; it seems improbable that it could fulfil its mandate with respect to Antarctica without belonging to this major scientific body.

As SCAR predates the signing of the Antarctic Treaty, it might be argued that scientists have "ruled" Antarctica for decades. This situation began to change with the signing of the Protocol on Environmental Protection, as the intergovernmental structure under the AT is assuming an increasingly active role in governing activities in Antarctica. At the same time, the role of SCAR has been formalized. Whereas the Treaty makes no reference to SCAR, several clauses in the

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4 Canadian Polar Commission (1993*): Canadians in Antarctica*. Polaris Papers. Vol. 1, No. 2. 11p.

5 For additional information about Canadians in Antarctica, see: Hattersley-Smith, G(1986): "Some Canadians in the Antarctic", *Arctic*, 39(4) pp 368-369 and Beeby, Dean (1994): *In a Crystal Land; Canadian Explorers in Antarctica*. University of Toronto Press. 262p.

6 Sixty-eight individuals from Canada and 59 from abroad responded to the questionnaire printed in the newsletter.

Protocol specify that input from SCAR is required in the decision-making process. Thus, at the international level, there are close links between governance and science in Antarctica, and it is suggested that this pattern should be mirrored at the national level. Scientific research continues to be the most significant activity on the continent.

SCAR has several affiliated Working Groups and Groups of Specialists, two of which are of special interest: the Council of Managers of National Antarctic Programs (COMNAP) and its sub-group, the Standing Committee on Antarctic Logistics and Operations (SCALOP). Both groups, and particularly COMNAP, are important forums for the exchange of information about Antarctic operations. However, considering the current level of Canadian involvement in Antarctica, as well as Canada's Associate Member status in SCAR, it seems premature to seek membership in COMNAP or SCALOP.

Upon joining SCAR, Canada declared its intention to become a full member as soon as possible, (i.e., at the next SCAR meeting in August 1996). This would involve presenting a national Antarctic research program acceptable to the members of SCAR. In view of the resources Canada currently allocates to scientific activities in Antarctica, it is doubtful that it would be accepted as a Full Member; therefore, it seems prudent to delay the application until the next SCAR meeting (in 1998) or later.

3. ANTARCTIC CHALLENGES AND OPPORTUNITIES

This section briefly reviews some of the factors to be considered in developing a Canadian Antarctic Research Program. Some relate to recent developments in Antarctica; others deal with domestic Canadian situations. Although there are some overlaps, the factors are presented in two groups: those related to the pursuit of polar science and those related to implementation of the Environmental Protocol.

Polar Science

Bipolar Studies

Canada occupies a large part of the northern polar region and is therefore well placed for participating in bipolar studies of similar phenomena occurring in the polar regions of both the northern and southern hemispheres. The distribution of stratospheric ozone and the effects this

has on the environment is a topic of current concern, and great benefits are derived from co-ordinated studies being conducted in both hemispheres. Similarly, one of the earth's geomagnetic poles is in Canada while the other—or its conjugate point—is in the Antarctic, thus, Canada is an obvious location for conducting co-ordinated studies of high-latitude geomagnetic phenomena. Also, cold and heavy bottom water formed in the polar and sub-polar parts of the oceans are exchanged between the two hemispheres; for example, waters from Antarctica influence the Grand Banks off Newfoundland. Clearly, Canada can contribute significantly to bipolar studies, and we have much to gain by joining other scientific groups in such investigations. On a global scale, Canada is a relatively minor player in science and technology activities, and is a net importer of new knowledge. We may want to make our facilities in the North more accessible to foreign scientists as a means of enhancing international co-operation on bipolar phenomena.

Science for Science's Sake

In the current climate of severe economic constraints, allocations to scientific activities are frequently justified in terms of specific (often economic or commercial) benefits that may result from the activity. It is important to note that such utilitarian motives have not been important in justifying scientific activities in the Antarctic. The pursuit of new knowledge for its own sake has been the driving force behind the scientific activities of most countries. The Antarctic Treaty established the continent as an area of "peace and science" where scientific studies would be a major activity and where related information would be freely shared among the parties.

Dispersed Federal Interests

Several federal departments have broad mandates that include Antarctica. For example, the Department of Foreign Affairs and International Trade is responsible for the intergovernmental and policy aspects of the Antarctic Treaty, including the Protocol on Environmental Protection; Environment Canada, through the Atmospheric Environment Service, has a significant interest in meteorological data from the area, particularly for studies of stratospheric ozone distribution, and for the development of global circulation models and Global Change studies; Fisheries and Oceans Canada has an interest in global ocean-current models and holds parts of international databanks containing Antarctic data; Natural Resources Canada's mandate extends to the study of glaciology and plate tectonics far beyond Canada's borders; and the Department of Indian Affairs and Northern Development is involved, because the minister is responsible for the Canadian Polar Commission. There is no co-ordination at the national level and no exchange of information among federal scientists involved in Antarctic studies, because it is not a major priority for any

department. A Canadian Antarctic Research Program, co-ordinated within the SCAR structure, would provide a valuable forum in which to focus these interests on national objectives. The CPC seems well-suited to co-ordinating this effort. By doing so, it would also bring together a pool of expertise that would provide important and relevant information and act as an information broker for the benefit of both government administrators and private-sector groups.

Dispersed Academic Interests

University-based scientists interested in Antarctica face a similar situation. They are also distributed among several widely scattered institutions, often with only one or two scientists at any one university. Much can be achieved by developing a network of Antarctic specialists.

"Cap-in-Hand"?

There is a fairly widespread perception in the scientific community (See *Canadians in Antarctica*) that Canadian scientists working in Antarctica somehow go there "cap-in-hand" and rely unduly on support from other countries. This perception is challenged. It is true that many are supported, often generously, by other countries, and their participation is often arranged on an opportunistic basis. But Canadian scientists work in Antarctica because their competence and expertise is valued by these countries, not because they are given "scientific welfare support". The "cap-in-hand" attitude can easily lead to a perception of dependency. This would be unfortunate, because Canadian polar scientists are respected, and they can empower themselves to develop a Canadian Antarctic Research Program.

Funding

Closely related to the previous point is the perceived lack of funding for Antarctic research. Government departments and the granting councils do fund research, and the best proposals will be supported. However, to obtain funding, it is essential to have a well-focused and carefully planned research program with clear objectives that address the concerns of the potential funding agency. Fortunately, planning a research program is relatively inexpensive compared with the research itself (especially in the Antarctic). Financial constraints are omnipresent today and for the foreseeable future, and, as a result, all concerned must be creative in seeking new partnerships as a means of obtaining additional resources. This is a major challenge for the small, dispersed and loosely co-ordinated "Antarctic science community" in Canada.

Facilities Available

As Canada examines how to develop a Canadian Antarctic Research Program, it is worth noting that the financial constraints so familiar to us also affect other countries and that, as a consequence, some of their Antarctic operations have been reduced. This means that space can be rented at existing stations for a relatively modest price compared with that of establishing a new facility. (The cost of access to a research facility is, of course, only one of several considerations in conducting a research program.)

Bipolar Dilemma

"Poles Together" or "Poles Apart"? This is a dilemma facing Canadians with regard to polar issues. It is still true that "...the fear that Antarctic research diverts human and financial resources from the Canadian North is extremely difficult to allay...".[7] This is a most unfortunate situation that seems to be based on two assumptions: that the Canadian North will only benefit from activities carried out within that region; and that a possible increase in Canadian expenditures in Antarctica will reduce expenditures in the Canadian North. Both assumptions are incorrect.

Recent issues such as the seal hunt, management of migratory wildlife species (e.g., caribou, birds), and transboundary pollutants from Eurasia contaminating the environment in northern Canada clearly show that the Canadian North is part of a much larger universe. Effective stewardship of the region must, therefore, consider activities and initiatives far beyond the borders of Arctic Canada. In fact, it may be argued that *because* Canada has major responsibilities in the North we *must* invest in Antarctic science and, by so doing, gain a better understanding of our own northern regions.

With respect to funding, were the federal government to increase its allocation to Antarctic activities, it would have to transfer these funds from somewhere in its annual budget. There is no guarantee that any reallocation would affect the North at all.

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[7] Burnet, P: *Canadian Interests in Antarctica.* Unpublished report prepared for the Department of Indian and Northern Affairs. June 1992, 23p. (mim.)

The Environmental Protocol

Some Protocol Provisions

The signing of the Protocol on Environmental Protection to the Antarctic Treaty in October 1991 by some 30 countries, including Canada, was a seminal event that does not appear to have fully registered in Ottawa. The Protocol is now being ratified by member countries and will profoundly affect Antarctic developments when it comes into force. Responsibility for enforcement rests with the parties, who must adopt implementing legislation to provide for, *inter alia*, a mechanism to review environmental assessment documents and applications, and, if appropriate, grant permits for Canadians to enter protected areas or collect scientific specimens from Antarctica. Through the Protocol, Treaty parties will assume a more active stewardship role *vis-à-vis* Antarctica. The agreement also calls for more extensive exchange of information among the contracting governments, and suitable mechanisms must be established. The Protocol is arguably the most stringent multilateral environmental legislation in place, and the references to SCAR clearly show that the scientific community will play a key role in its implementation. The nature of the Antarctic science effort will also change, as a larger proportion of it will be directed toward environmental problems.

Twenty of the 26 countries that must ratify the Protocol for it to enter into force have already done so. Seven countries have also passed domestic implementation legislation, so, for the citizens of these countries, the Protocol is already in effect. In any case, in the Final Act of the Madrid meeting, where the Protocol was signed, the signatories agreed "...to apply Annexes I–IV...to the extent practicable..." until the Protocol has been ratified and entered into force.

Positive Trade Balance with Antarctica

Canada must ensure that its economic interests are protected and, where possible, expanded. Several companies provide goods and services to Antarctic operations, and it has been suggested that Canada is the only country in the world to earn a net profit from its activities in the Antarctic. Private-sector companies are themselves primarily responsible for ensuring that their activities conform to relevant environmental legislation; (particularly important in the environmentally sensitive tourism industry) and requires environmental experts familiar with Antarctic conditions and applicable Canadian rules and practices.

Government agencies also have an important role to play in developing suitable implementation mechanisms to inform proponents of the legislative requirements, in evaluating submissions, and in conveying the appropriate information to other treaty countries.

Strict Requirements—New Technologies

To meet the requirements of the Protocol, Antarctic operators will need to develop new environmental control technologies, a fact which could open new opportunities for Canadian companies specializing in this field. It is often stressed that there are no permanent settlements in Antarctica, but people *do* live there; even the winter population at McMurdo Base (the largest in Antarctica) exceeds that of some Arctic communities in Canada. While each community is unique, all share basic characteristics: isolation; exposure to polar environmental conditions; and a need for energy-efficient heating systems as well as technologies to manage emissions, effluents, and other wastes in an environmentally acceptable way. Companies marketing state-of-the-art services in these fields would likely discover opportunities in Antarctica. The experience gained from the clean-up of DEW-line sites in northern Canada may be valuable. In addition to exporting goods and services to Antarctica, companies may look for opportunities to transfer technologies currently used in Antarctica to markets in the Canadian North and other parts of the Arctic (e.g., Russia).

Conflict Resolution Mechanism

Antarctica may also be regarded as a unique example of co-operation among parties with apparently irreconcilable demands. There are no native land claims in Antarctica of the type we know in Canada, but there *are* territorial claims. However, in the Antarctic Treaty, the parties devised a mechanism for jointly managing; notwithstanding their separate rights, the claimant countries recognize that they have overriding common responsibilities for environmental stewardship. The Antarctic Treaty is an example of a successful conflict-resolution mechanism that may be applicable in other areas.

Arctic Environment/Antarctic Environment

Canada is an active partner in the Arctic Environmental Protection Strategy (AEPS), an agreement which, in some respects, can be regarded as a northern parallel to the Environmental Protocol in Antarctica, yet our role in the Antarctic is relatively minor. Among our Arctic partners, Iceland does not belong to any Antarctic body, and Denmark is a non-Consultative Party

to the Antarctic Treaty but does not belong to SCAR. The other Arctic countries—Finland, Norway, Russia, Sweden, and the U.S.—are all Consultative Parties to the Antarctic Treaty and full members of SCAR. Chile is also promoting bipolar links, and the senior co-ordinating bodies within AEPS and the AT are forging closer ties through the regular exchange of information and by granting observer status to other groups at their meetings. Evidently, other countries see greater benefits from bipolar studies than does Canada.

4. ESTABLISHING A CANADIAN ANTARCTIC RESEARCH PROGRAM

The preceding pages provide background information and an analysis of recent developments in Antarctica, the implications of these for Canada, and some Canadian attitudes *vis-à-vis* Antarctica. There is nothing to suggest that the course set by the CPC following the *Antarctic Science Workshop* should be significantly changed. However, two modifications are suggested, and a work program is proposed that would lead to the establishment of a national Antarctic research program and allow Canada to become a full member of SCAR. This section outlines the modifications, including a revised set of objectives. The work plan and the required financial and human resources will be covered in the following sections.

The first modification relates to *terminology*. It has become apparent that the name "Canadian Antarctic Research Program", as used in the CARP newsletter, conveyed the impression that Canada had established a new, funded research program in Antarctica. Many were disappointed to learn this was not the case. In view of this reaction, the name "CARP" should henceforth be used only to refer to a program that will be established at some as-yet-unspecified time.

The loosely organized group of Canadians interested in Antarctic issues who have added their names to the mailing list for the newsletter will be known as the Canadian Antarctic Research Network (CARN), and the newsletter as the "CARN Newsletter". The term "network" describes more accurately the nature of this group and avoids the funding and co-ordination connotations associated with the term "program". CARPEX will publish the CARN Newsletter.

The second modification concerns the *mandate* of CARPEX. As outlined in *Canadians in Antarctica*, the mandate has been restricted to scientific issues and their promotion. The points raised in the preceding section show that the Government of Canada, and the Canadian Polar Commission, need specialized advice on a wider range of issues, beyond those of science *per se*. This would seem to leave a choice between expanding the mandate of an existing committee and

establishing another group. In view of the number of Canadians with detailed knowledge of the continent, the former alternative is recommended.

Such a broadening of the mandate does not detract from the prominent role science plays in Antarctic affairs, and seems to be in line with the CPC's policy on polar science which affirms that: "Above all, a sense of purpose must clearly guide Canadian research in the polar regions".[8] The "purpose" is more than the pursuit of knowledge. The recent report of the National Advisory Board on Science and Technology also argues that science and technology should be seen in a broader societal context.[9] A modified mandate for CARPEX should also be reflected in the membership.

CARPEX—Mandate and Objectives

As outline in the previous section, the mandate of CARPEX will be to promote Canadian research activities in the Antarctic, especially those of a bipolar nature, and to advise government and private-sector groups on Antarctic matters. CARPEX will have the following objectives:

- to define and assess the strength of Canada's Antarctic research community;
- to define Canada's scientific and other interests in Antarctica and to seek means of pursuing those interests;
- to promote Antarctic and bipolar studies in Canadian universities, government agencies, and the private sector;
- to provide advice on Antarctic matters, especially environmental issues, to government agencies and others;
- to serve as a focal point for dissemination of information about Antarctic issues among Canadians;
- to facilitate communication among Antarctic scientists in Canada;
- to develop a Canadian Antarctic Research Program that will meet the criteria for a national Antarctic program in accordance with the rules of the Scientific Committee on Antarctic Research (SCAR); and

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[8] Canadian Polar Commission: *Toward a Policy for Canadian Polar Science and Technology*. Polaris Papers No. 8. 1995, 10p.

[9] *Healthy, Wealthy and Wise*. Report of the National Advisory Board on Science and Technology. 1995, 106 p.

- to act as the formal link between the Antarctic research community in Canada and the Canadian Polar Commission.

5. CARPEX WORK PROGRAM

CARPEX will provide advice on Antarctic matters as required and promote Antarctic studies in Canada on an ongoing basis. In addition, it will undertake a series of 11 specific tasks to fulfil its objectives. These are listed in three groups under the headings, "Canadian Antarctic Research Program", "Communications", and "Administration". All will require a commitment of human and financial resources, but no attempt has been made to identify these in this paper.

Canadian Antarctic Research Program

It may be useful to clarify what is meant by the term "program". In most cases, a program is seen as a major activity, consisting of several discrete projects, that is centrally funded and directed, and supported by a significant infrastructure. Several countries have Antarctic programs of this type (e.g., British Antarctic Survey [BAS] in the UK; the Norwegian Polar Research Institute [NPRI] in Norway; and the National Science Foundation [NSF] in the U.S.), although the dominant roles they previously played within the respective countries have been reduced as other funding agencies have become active in Antarctica. It is not expected that Canada will have any similar group in the foreseeable future.

What Canada will have is a growing number of scientists and engineers from academia, government, private-sector companies, and other groups involved in Antarctic research. But there will be limited central funding and direction, and the groups and individuals concerned will meet to share plans, exchange information about current developments and opportunities, and co-ordinate activities where appropriate (e.g., logistics). In this scenario, the Canadian Antarctic Research Program (CARP) will consist of a series of projects funded by a variety of groups and co-ordinated to a limited extent by CARPEX, which will report to SCAR via the CPC on all Canadian scientific activities in Antarctica.. The details will only be known when the program is better defined.

There are two critical elements in seeking recognition as a national program: a significant Canadian content in the intellectual conception and conduct of the program, and a sufficient

allocation of financial and human resources by Canadian agencies such that they maintain a significant say in the actual implementation of the program. In short, a national program requires that Canadians have control of the program objectives and logistics. In the past, it was relatively easy to identify a national program, because countries established their own station(s) and were completely in charge of the research activities conducted there. Over the years, international co-operation has become considerably more integrated. There is much more "shoulder-to-shoulder" co-operation between scientists from different countries, and scientific program objectives are often defined by international teams of scientists. (It can be argued that the SCAR structure is somewhat out of date, as it is based on a narrow definition of national program) In the current setting it is often difficult to assess the contributions of separate countries, and it is obviously a matter of judgement to determine what is sufficient to qualify as a national program.

Although Canada's is unlikely to be a large Antarctic research program, size is not considered a critical factor. More important will be the quality of the research Canadian scientists conduct, and the manner, consistency, and determination with which Canada contributes to the international scientific goals pursued in Antarctica. However, as the funding sources for Antarctic science become more diverse, the credibility and effectiveness of the mechanisms in place for dealing with Antarctic scientific issues at the national level are likely to become more important in judging the application.

A broad range of projects could be included in the CARP. Traditionally, Antarctic science has been associated with expeditions and fieldwork on the continent itself, and such activities will be included. But the CARP could also include studies aimed at modelling Antarctic phenomena (e.g., analyses of field data collected by others, or obtained from remote sensors in airplanes or spacecraft); social studies, including economics and political science; and legal studies.

The following tasks are designed to identify the nature and extent of Canada's current involvement in Antarctic science and to examine related activities as a basis for planning new initiatives.

1) *Antarctic Research Projects with Canadian Content/Interest*

An annotated list of current Antarctic research projects with Canadian participation, or projects where Canadians have an active and significant interest in the outcome (e.g., those with important bipolar links).

2) *Canadian Contributions to Antarctic Science*

A bibliography of scientific papers published by Canadians since 1988. Entries would include author(s), scientific disciplines, and date of publication. Other forms of contribution (e.g., participation in planning, managing, technology transfer, and logistics expertise) will also be included.

3) *The "Antarctic Community" in Canada*

A review of the current database on Canadians who have expressed an interest in Antarctic issues and a description of this group in terms of field of interest, Antarctic field experience, publication record, current affiliation, etc. Are there particular strengths, weaknesses, or gaps ?

4) *Support for Canadian Scientists in Antarctic Research*

An overview of financial and other resources allocated to support Canadians involved in Antarctic research. Cash allocations and estimates of in-kind contributions from all sources will be included to the extent possible. How much support is obtained from abroad, in kind, or in cash, and from what sources? What concerns/problems exist?

5) *Possible Co-operative Research Activities and Reciprocal Use of Facilities*

An overview of possible locations/programs where Canadian scientists may participate in joint research activities in Antarctica. This would include a description of possible reciprocal arrangements that will allow foreign scientists to work in northern Canada in return for Canadian use of research sites in Antarctica.

6) *Canadian Businesses in Antarctica*

An overview of Canadian businesses providing goods and services to Antarctic operations, and the economic significance of this market for both the companies themselves and for Canada at large. Where possible, these interests should be seen in the context of the global investment in Antarctic activities. Does any group appear to be missing market opportunities?

7) *Canada's Scientific and Other Interests in Antarctica*

An outline of the national goals and objectives Canada wishes to pursue in Antarctica. What are the Canadian interests in Antarctica, and what specific objectives should a Canadian Antarctic Research Program address? The outline should reflect the global mandates of relevant federal agencies (e.g., Foreign Affairs and International Trade, Environment Canada, Natural Resources Canada, Fisheries and Oceans Canada, the Natural Sciences and Engineering Research Council, and the Canadian Polar Commission). Bipolar aspects are expected to be important.

8) *The Canadian Antarctic Research Program*

With the completion of Tasks 1–7, it will be possible to develop a Canadian Antarctic Research Program and to seek funding for it in time to apply for full membership in SCAR. It is suggested that the CARP will have three components: basic research to seek new knowledge for its own sake (curiosity-driven research); research in support of government functions; and research in support of technological and commercial development. In designing the CARP, it is essential to be aware of current and anticipated developments within the international Antarctic science community. There is already an extensive effort underway, and the CARP must be integrated into that framework. It is anticipated that the CARP will include joint projects with one or several other countries.

Communications

9) *CARN Newsletter*

As the Antarctic community in Canada is scattered from coast to coast, it is impracticable and expensive for members to meet face-to-face. Therefore, a CARN newsletter is essential as a means of exchanging information. The publication should be issued twice a year, in May and October. The first number would report on the previous (austral) summer's activities, the latter on plans for the coming season. The newsletter should also list: upcoming meetings; reports from recent meetings of interest to the Antarctic community (e.g., SCAR, Antarctic Treaty Consultative Meetings, and others); notes about the role and *modus operandi* of SCAR, COMNAP, SCALOP, the Antarctic Treaty System (ATS), and relevant developments in the Arctic. Contributions to the newsletter should be short, with a focus on promoting awareness rather than providing detailed information. They should include contact points for those wishing further details. Readers' feedback and contributions should be encouraged as a means of ensuring that the newsletter remains relevant to its constituency.

In view of rapid technological developments, the means of information dissemination should be reviewed from time to time. Most scientists already have Internet access, and a CARN site on the World Wide Web (WWW) would likely be useful. This could be integrated with the current CPC "home page", but, as the target audience includes many non-scientists, a hard-copy newsletter will still be required for the time being. SchoolNet is another effective means of providing information about Antarctica to schools; a Canadian scientist already uses the network to communicate the results of fieldwork in McMurdo Sound to schools in the Ottawa area.

Administration

10) *CARPEX Annual Report and Budget*

To improve planning and enhance accountability, CARPEX should submit two reports per year to the CPC: an annual report summarizing activities and results achieved, including comments on issues of concern to the committee; and a proposed workplan, with deliverables, milestones, and a budget, for the next fiscal year.

Feedback from the CPC on both items is essential. Any uncertainty should be addressed promptly to ensure a common understanding of what is expected. Appropriate filing systems should be established and maintained. It is not necessary for the CPC to be aware of every CARPEX activity, but a certain level of "corporate memory" should be retained by the CPC.

11. *Evaluation Framework*

At some stage (perhaps two years from now) the CPC may wish to have an independent party evaluate CARPEX and its activities to assess its relevance, efficiency of operation, and accomplishments. In anticipation of such a review, CARPEX should identify what type of questions ought to be asked at that time.

6. RESOURCE REQUIREMENTS

Human and financial resources will be required to complete the proposed CARPEX work program, thus, it is important to clarify where these resources may come from. The following section deals with this issue.

Human Resources

The CPC's mandate includes the promotion of polar knowledge, and its success depends to a very large extent on the credibility and scientific reputations of the individuals involved. CARPEX should, therefore, consist of Canada's top Antarctic scientists and should be adequately supported. Appointment to CARPEX would imply national and international recognition, and members would be expected to devote time and effort to CARPEX activities. This is particularly important in a time of fiscal restraint, when university faculty members have little time for research-related activities not directly benefitting their individual scientific interests. With the CARP, a disproportionate amount of work has tended to fall on the shoulders of two individuals. This situation is not sustainable. The obligations of CARPEX membership should be stressed prior to appointment. Additional support can be obtained by widening the network and by involving individuals from outside CARPEX itself. An alternative would be to engage support staff (e.g., graduate students); however, participation by a greater number of scientists would be the preferred solution.

Much of the routine work associated with running CARPEX could be handled by the CPC if it were able to assign an individual with experience in Antarctic matters. This would remove a considerable work-load from CARPEX members, provide CARPEX with a permanent address, and facilitate better integration of the activities of the CPC and CARPEX. Printing and distribution of the CARN Newsletter could also be handled by the CPC.

In view of the broader mandate of CARPEX, membership should be expanded to include a representative of the private-sector groups operating in Antarctica and a representative from the Department of Foreign Affairs. This would enable CARPEX to cover both commercial and political aspects of Antarctic research.

Financial Resources

Expenditures related to Canada's involvement in Antarctic science are considered in three separate categories: membership fees in international associations (e.g., SCAR) and related costs; funding for CARPEX activities; and funding for research activities *per se*.

Membership Fees

These include the annual fee to SCAR and the cost of national representation at SCAR's biannual meetings. The 1995 fees are US$5,000 per year for associate membership and US$7,000 per year for full membership. These costs should be carried by the CPC as the adhering Canadian organization.

Member countries are encouraged to name representatives to SCAR Working Groups, Groups of Specialists, and other sub-groups. The relevance of these groups to Canadian objectives will vary: in some cases, representation will be a matter of national importance; in others the rationale for attendance may be based primarily on the interests of individual scientists. In the former instances, the CPC would be expected to cover a large proportion of the cost of attending; in the latter, a major part of the cost should come from the scientists' research funding. Cost-sharing should be decided on a case-by-case basis. However, it is essential that an overall meeting attendance plan, reflecting CPC/CARPEX priorities, be prepared at the beginning of each fiscal year.

In allocating funds for attendance at workshops, seminars, or other meetings, the CPC should be cognizant of the value of maintaining networks within the scientific community. Contacts at such meetings often lead to an awareness of new developments and opportunities for the promotion of Canadian interests. As a new member of SCAR, Canada should be prepared to establish such networks, and this could be a consideration in setting the budget for SCAR-related activities.

Feedback and follow-up from meetings are absolutely essential in demonstrating the benefits of attendance. Those receiving public funds to participate in meetings should report back to the Antarctic community in Canada through CPC/CARPEX and/or the CARN Newsletter. Special attention must be given to cases where follow-up action is required.

Cost of CARPEX Activities

CARPEX requires financial support to operate and to complete the work program as outlined in Section 5. Although it is anticipated that CARPEX members will undertake part of the work and that the CPC will provide certain services, extra assistance from graduate students and others may be required. Travel and meeting expenses may also be involved, as will telephone, fax, and mail services. This will become an important consideration as organizations continue to downsize and concentrate on core activities.

Despite rapid changes in electronic communications, meetings are still required, and the CARPEX budget should allow for at least one meeting a year. While cost should be considered in the choice of location, these events should also be viewed as a means of maintaining contact with the Antarctic community across the country; therefore, efforts should be made to hold meetings in different locations.

The budget should also provide some support for members' participation in other meetings —in Canada or abroad—that are of interest to the committee. Again, the importance of networking is emphasized.

From time to time, the CPC may ask CARPEX to undertake special tasks for which additional funding should be made available.

As the proposed CARPEX work program directly supports the CPC's mandate, a part of the costs should be covered by the CPC. However, several other federal agencies with interests in Antarctica will also benefit from the work of CARPEX and should be approached for

contributions. Hopefully, CARPEX activities can be supported by a partnership of the CPC and other key federal departments. It is believed that a rather modest contribution from several partners can yield significant benefits for all. All the partners would, of course, have a say in how pertinent aspects of CARPEX activities are conducted. The role of CARPEX will be to provide information and advice, and not to interfere with the mandates of the line departments.

Other Considerations

The priorities of the Canadian Polar Commission are beyond the scope of this report, but some comments seem relevant. The CPC's mandate covers two distinct geographical areas: the Arctic and the Antarctic. Obviously, interests in the North far exceed those in the South, and the allocation of CPC resources reflects this. However, there are many agencies and groups engaged in promoting and developing knowledge of the Arctic (e.g., Association of Canadian Universities for Northern Studies; Arctic Institute of North America; Canadian Arctic Resources Committee; the Science Institutes of the Northwest Territories; and research groups in native organizations and in federal, provincial, and territorial agencies). All contribute to fulfilling the CPC's mandate. Furthermore, several members of the current CPC Board of Directors live in the North and thus have very detailed knowledge of the issues.

With respect to the Antarctic, the situation is quite different. The CPC is the only Canadian agency with a mandate to promote polar science in, and knowledge of, the south polar region. CARPEX and CARN are the only pools of individuals with firsthand experience in Antarctic science, with detailed knowledge of the southern continent, and with links to the international Antarctic network. The CPC relies heavily on this group, and its resource allocation to CARPEX ought to reflect this.

7. FUNDING OF RESEARCH ACTIVITIES

Although a detailed discussion of fundraising may be premature until such time as the CARP has been more clearly defined, the following section outlines some avenues that may be explored.

From the outset, it is recognized that the CPC has a mandate to promote polar science, not to fund it; funding for research projects must be obtained from other sources. As suggested, the research activities may be considered under the following three broad categories. The source of funding will depend on the category.

1. Basic research to seek new knowledge (curiosity-driven research)
2. Research in support of government functions
3. Research in support of technological and economic development

For the first category, the primary source of funding would be the three granting councils (Natural Sciences and Engineering Research Council of Canada [NSERC], Social Sciences and Humanities Research Council of Canada [SSHRC], and Medical Research Council of Canada [MRC]), similar provincial granting agencies, and university research funds. Whatever the source, the granting body must take account of the special logistical demands of operating in the Antarctic. (Only a few years ago, this same argument had to be made regarding research in our North.)

The second category could be supported by the relevant federal department (e.g., Environment Canada for projects related to the Protocol on Environmental Protection; the Department of Foreign Affairs and/or Justice for studies of legal and political aspects; Fisheries and Oceans Canada for oceanographic work). Among federal departments, Foreign Affairs plays a key role, as it must formulate Canada's position on Antarctic issues from a foreign policy perspective.

For the third category, companies seeking to develop and/or market new products and services may be interested in supporting this type of study. Marine Expeditions Inc. ships are already providing some assistance to scientists (none of them Canadians!) working in the Antarctic Peninsula area. These companies have access to federal and provincial programs in support of industry and trade. An example is the "Strategy for the Canadian Environmental Industry"[10] announced jointly by Industry Canada and Environment Canada in September 1994.

Such companies would also have an interest in developing Canadian expertise for the preparation of environmental impact assessments for Antarctic project proposals. Familiarity with Canadian procedures and practices will be most useful when the Environmental Protocol enters into force, because it is Canadian legislation that will apply.

The preceding paragraphs suggest a project-by-project funding arrangement. Depending on the nature of the program, this may be the most appropriate approach. An alternative would be to develop a well-integrated and cohesive program, and to seek a major grant under the Research

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[10] *A Strategy for the Canadian Environmental Industry*. Industry Canada and Environment Canada. September 1994. 31p.

Partnership Program administered by NSERC. Such a program would benefit from close co-operation among the three major sectors (i.e., government, academia, and the private sector) and would require an effective co-ordinating mechanism.

Such partnerships can also be international. Canada has bilateral science and technology agreements with several countries, and these can be used as vehicles for promoting joint research programs. Funding is associated with some of these programs.

The individual scientist is expected to play a key role in seeking funding for proposed research projects. He/she knows the issues best and, through direct contact with potential funding sources, can tailor proposals to the needs of the funding agencies, thus increasing the likelihood of success.

It has been pointed out that Antarctic research *per se* does not have high priority among funding agencies at this time. However, the agencies do have high-priority programs, some of which extend to the Antarctic. For example, both the Global Change Program and the Biodiversity Strategy have projects in the Antarctic. Similarly, large global oceanographic programs, such as the World Ocean Circulation Experiment (WOCE), extend into the Southern Ocean surrounding the continent. Scientists may have a better chance to obtain funding by considering their proposals in the context of one of these programs. Research to support implementation of the Protocol on Environmental Protection is almost certain to get higher priority in the future. CARPEX should be prepared to advise scientists on funding strategies.

So far, mainly conventional sources of research funding have been discussed. As an alternative, private foundations could be approached, and they may respond favourably if the right message is skilfully articulated. Canadian foundations have already supported the activities of groups like the Centre for Cold Ocean Resources and Engineering (C-CORE), the Centre for Frontier Engineering Research (CFER), and the Canadian Arctic Resources Committee (CARC). The pursuit of such funds should be the responsibility of the CPC, as it has the prestige and contacts required for success. CARPEX's main role would be to supply supporting documentation.

Finally, it should be remembered that support is not restricted to cash, grants, or contributions; it may be in-kind. In view of the strong interest demonstrated by some countries in bipolar studies, Canada could offer access to, and use of, research stations in our North in return for the use of other countries' Antarctic research facilities. Canadian facilities could be offered at little or no cost. Any arrangement of this type will demonstrate Canadian interest in Antarctic research by "putting equity on the table".

Other Forms of Support

In addition to infrastructural support for the CARP, the CPC must provide another important support function: advocacy.

As an advocacy group the CPC should promote Antarctic science, stress its importance to government and granting agencies, help scientists resolve special problems in Antarctic work, and seek an appropriate level of financial support. To be effective in influencing decision makers, the CPC will require access at senior management levels; the prestige of the CPC and the calibre of its Board of Directors would seem to ensure this. The CPC also needs to assess clearly current conditions, analyse associated problems, and propose practicable solutions to improve the situation. CARPEX, with its "front-line" experience in Antarctica, will, in most, cases, be best placed to provide documentation of this type.

Two current issues are: the cost of field maintenance for U.S. scientists at some Canadian research stations for bipolar research groups as compared with the costs of similar services for Canadian scientists at McMurdo Station in Antarctica; and the adequacy of NSERC grants to support fieldwork in the Antarctic. Already some progress seems to have been made regarding the first item.

The primary targets for a lobbying effort on the part of the CPC would be top managers in government departments and agencies. However, lobbying at the political level would also be helpful—even necessary—in many cases. For lobbying to be effective, it is important to have a constituency that expresses interests and concerns about issues. At present the "Antarctic constituency" in Canada is limited to a small group of scientists; however, more than 200 Canadians visit Antarctica as tourists each year, so the number of Canadians with firsthand knowledge of the continent is growing rapidly.[11] CPC/CARPEX should explore ways of informing that group about their existence and current activities.

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[11] Some of these have formed the Montreal Antarctic Society to promote Antarctic studies.

8. SOME POLICY ISSUES

This reports deals with the establishment of a scientific program that would respond to scientific challenges in the Antarctic. Recognizing that at least some part of the funding needed to implement such a program would come from federal sources, the question must be asked: What is the federal government's policy on Antarctic matters? The answer is not clear.

The list of initiatives listed in Table II is encouraging, but the resources allocated to follow up on these initial steps have been very modest. More than four years have passed since Canada signed the Environmental Protocol but, other than a review by Department of Justice staff to assess its compatibility with existing Canadian statutes, there has been little progress. The Protocol seems to remain in the domain of the legal community, while the substantive issue in the Protocol (i.e., environmental protection) has been largely ignored.[12] It appears that Environment Canada ought to become more involved, as that department has most of the technical expertise required to implement the Protocol and subsidiary legislation. After signing the Protocol, the next logical steps would be to ratify it and to pass implementing legislation. Ratification can be done rather easily, but preparation of implementing legislation will be a more elaborate and time-consuming process. What are Canada's intentions regarding the Protocol? The answer to this question will be a reflection of how Canada sees itself as a partner in global environmental issues.

In the Arctic, Canada played a key role in the establishment of the International Arctic Science Committee (IASC), in the development and implementation of the Arctic Environmental Protection Strategy (AEPS), and, more recently, in the formation of the Arctic Council. In short, it has assumed a leadership role in promoting international science and co-operation and the creation of new structures. What role does Canada see for itself in the Antarctic, were it not so directly affected by developments? Does Canada plan to seek Consultative Party status in the Antarctic Treaty System, thus joining most of our Arctic partners who already participate in Antarctic decision making? Does Canada see itself as a polar or as only an Arctic country?

The scientific issues will be considered by CARPEX, but there are other, political considerations. One is the training of young Antarctic specialists, some from developing countries with a limited tradition and background in polar work. Canada has well-developed, and internationally recognized, environmental assessment procedures; is endowed with a large Arctic territory, and

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[12] This could explain why the signing of the Protocol in October 1991 was not mentioned in the Annual Report on the Green Plan.

has excellent training facilities within universities and at a number of scientific field stations. Canada could open these facilities for training purposes and thus contribute to the overall training of future Antarctic scientists. At the same time it would contribute to competence-building in the developing world as part of the development assistance program.

There are roughly 200 countries in the world, and about 40 of these have acceded to the Antarctic Treaty. In other words, one in five countries belong to the AT System. On the African continent there are approximately 50 countries, and only one (South Africa) has ratified the AT. The anomaly—mainly a legacy of past racial policies in South Africa—is startling. Are there bridges to be built between the AT and countries previously alienated from the Treaty? If so, Canada can play a constructive role among the large number of African francophone countries.[13] Canada is currently preoccupied with internal conflicts between various groups, and it would offer some perspective to consider what a bilingual and bipolar Canada could contribute to our knowledge of the polar regions and to our ability to manage these areas effectively.

At first glance, these questions may seem to be far removed from the field of science, but in Antarctica science plays a very significant role in all aspects of development. Participation in scientific activities is a means of gaining knowledge and influencing developments. Task 7 will initiate some useful discussions about these issues among Canadian stakeholders, but the Department of Foreign Affairs must articulate the vision of Canada as a polar country.

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[13] Perhaps, we may one day see a student from Chad, enrolled in a Ph.D. program at Laval University, doing her thesis on a project in the Dry Valleys of Antarctica!

9. SUMMARY AND RECOMMENDATIONS

This report has reviewed recent developments in Antarctica and how Canada has dealt with these developments, particularly as they affect the establishment of a Canadian Antarctic Research Program (CARP). A series of factors to consider in that process is outlined, some dealing with international developments, others with domestic Canadian concerns. The signing of the Protocol on Environmetal Protection to the Antarctic Treaty and its implications are considered the most significant factors.

The current CARP Newsletter should be renamed and called the Canadian Antarctic Research Network (CARN) Newsletter to more accurately reflect its functions. The mandate of CARPEX should be modified to cover all Antarctic issues of concern to Canada, and a work program for CARPEX is outlined to lay the foundation for formulating a Canadian Antarctic Research Program.

Ways of obtaining financial resources to support CARPEX activities, including the completion of the work program, are discussed and possible sources of financial support for the research program itself are considered. Depending on the nature of the final program, granting councils, government departments, and the private sector are the most probable sources. Private foundations might also be approached for support for some of the proposed activities. An application for full membership in SCAR should be delayed until the new program has been designed and at least a significant part of the necessary funding has been secured. This will be a challenge, as financial constraints have curtailed many programs, but these constraints must never become easy excuses for failing to explore new ideas and approaches to issues.

The total amounts needed for the CARP are not considered major—the low level of interest in Antarctic issues may prove to be the greater challenge. Lobbying among bureaucrats and politicians on behalf of the CARP would be required. Efforts to develop an Antarctic constituency should be considered, especially in view of the number of Canadians who visit Antarctica as tourists each year.

Finally, some policy issues are addressed. Clarification of the policy of the Government of Canada with regard to its treaty obligations in Antarctica, especially *vis-à-vis* ratification of the Environmental Protocol, would be most helpful in formulating the CARP. The CARP, in turn, would assist in implementing the policy, because science is involved in almost every Antarctic issue.

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ANNEX I

Participants in the November 18, 1995 meeting at the Canadian Polar Commission offices, Ottawa, Ontario

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